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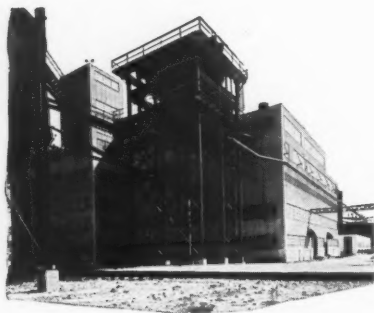
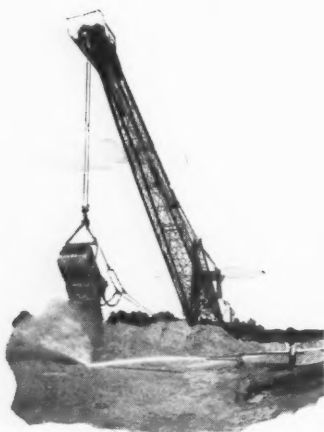
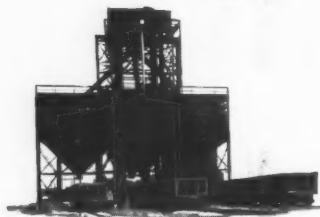
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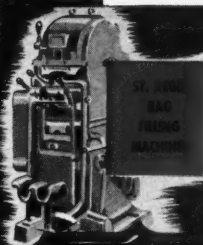


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MANUFACTURERS OF HI-NITROGEN AGRICULTURAL PRODUCTS

The American FERTILIZER

Vol. 108

MAY 1, 1948

No. 9

Soils, Hops, Minor Element Fertility*

By LEE VAN DERLINDEN

Research Director, Chas. H. Lilly Co., Seattle, Wash.

HOPS are a peculiar crop, heir to many diseases and insect troubles, mildew and nutritional difficulties. All these difficulties I cannot deal with in this report. It is, however, in relation to hops as it is with human, animal or poultry, quite true that faulty nutrition makes the living organism subject to disease. We know by long experience that tomatoes, beets, trees, in fact all plants, are more resistant to disease when properly fed than they are when improper plant nutrition is practiced.

It is likewise true that there is still some dissension among agricultural authorities as to what constitutes a proper ration for plants. No such dissension exists among animal husbandry teachers, as you may learn by calling on any feed store. Even the most uneducated person handling feeds knows, because his feed source teaches him, that an animal requires proteins (nitrogen in organic form) iodine, copper, cobalt, manganese, sodium, iron, zinc and other mineral elements, as well as vitamins.

But the average agriculturist, while acknowledging these requirements of animals, will not admit the same need in plants.

You may ask, why were not these mineral supplements required 50 or even 30 years ago and few have the answer.

The explanation is, our soils were not yet depleted of these elements and our wheat, our corn and other forages and foods had not yet

been made to grow three blades where one grew before.

Witness, if you will, how hybrid corn has affected our soils. Where 30 bushels grew before, now 100 bushels is commonplace. Yet no change is made in general fertility amendment practices and who can deny that this 100 bushel yield requires more plant foods than did the original 30 bushels? This hybrid corn, so widely used for feed, is a boon to the artificial or mineral feed supplement producer.

New varieties of corn, wheat, even potatoes, lettuce or other truck crops designed to produce heavier crops are creating a serious drain upon our most important national resource, the plant food content of our soils.

This does not particularly affect the hop producer, unless he has been able to do as the corn seed producers have done, create a greater yield by plant breeding.

Soil Not Inexhaustible

I have long been interested in learning why so many growers do not understand, or at least admit, that the soil on your farm, is exactly like a bank from which you can draw out only as much as you place in it.

Hops are like any other crop, they require plant foods. If all the necessary foods are placed within reach of the plant's root system, the plant never has to defer its natural objective, *species reproduction*, until it can throw out sufficient new root growth, with which to search the soil for the necessary element

*Portions of an address delivered at the Hop Growers Convention, San Francisco, February 20, 1948.

which may be any one of a dozen or even 20 needed minerals.

For, a plant, even as a human or animal, is imbued with the instinct (if I may use the term) of reproduction.

Hops, or any other crop, have feeding habits with peculiar results, which, if observed, closely approximate the feeding habits and results of animals. If a cow, for example, is obliged to range a full four or five acres of pasture in order to secure sufficient feed (grass) to maintain bodily tissue, produce a calf, and yet maintain a milk flow—she will grow thin, display mineral and vitamin deficiency symptoms and will produce a small milk flow and a poor calf. This is because too much energy is used up in traversing the four or five acres and such food energy as she absorbs is expended in maintaining bodily functions.

Yet, that same cow, placed in a well fertilized half acre, where she need but take a step to secure new and lush grass will put on weight, its body, particularly its back, will smooth and straighten out, its milk flow will increase greatly and it will produce a heavy, healthy calf.

Therefore, it is true that a cow or a hop plant functions similarly so far as nutrition is concerned and you, who grow hops, will do well to bear these facts in mind when planning on a hop nutritional program.

Perhaps you will be interested in partial chemical analysis of a fair hop crop. Believing that you are, I submit the following table.

TABLE 1
1 Ton

Nitrogen.....	81 lb.	Iodine.....	.01 lb.
Phosphate.....	14 "	Boron.....	.03 "
Potash.....	39 "	Sulphur.....	17 "
Lime.....	30 "	Zinc.....	.30 "
Magnesium.....	21 "	Iron.....	6 "
Copper.....	.04 "	Molybdenum...	.01 "
Manganese.....	11 "		

The real purpose I have in mind is to teach the truth that many elements other than those considered as plant foods since the fertilizer industry was created, should or must be considered, not as we designate them "minor elements" but as being of major importance in the production of any plant or any soil.

That this fact has not been given sufficient attention is probably because so few fertilizer producers have the necessary technical help, with a knowledge of proper combinations of these so-called minor elements.

My files are filled with reports from apple, hop, peach, pear, cherry growers who report remarkable increase and quality improvement as a result of a carefully planned quantitative

soil analysis, the computation of a complete fertility amendment program based on: (1) quantitative soil analysis; (2) fertility amendments based on (3) soils' plant food content, (4) crops' plant food needs.

A Specific Test

As an indication of how such a program functions, I submit to you, a report which will be made (January 20, 1948) to one of Washington-Oregon's prominent hop growers, Williams & Hart, Portland, Ore.

So that you may follow this program from the soil to the time the crop begins to grow, here is our report:

SOIL EXAMINATION

Basis 6-in. depth

1. PH Value 7.5, about .7 too high.
2. Active Calcium—2,860 lb. Should be 3,300 lb.
3. Available Phosphate—60 lb. Low.
4. Available Potash—140 lb. Fair only.
5. Total Organic (humus), 0.043 per cent (860 lb.). Almost none—the figure to be good should be at least 0.350 per cent or 7,500 lb. Total nitrogen content controls: (1) aeration; (2) water drainage; (3) water holding capacity; (4) natural or organic plant food; (5) bacterial action; (6) capillary water action. The soil in this case lacks somewhat in these requirements.
6. Active Magnesium—436 lb. Fair.
7. No Copper.
8. 20 lb. Manganese. Fair to good.
9. No Iodine.
10. 6 lb. Boron. Fair only.
11. 15 lb. Sulphur. Low.
12. 50,500 lb. Iron. High but largely tied up.
13. No Zinc.

Now, Williams & Hart wish to grow a progressively better hop crop on this soil. Let us examine the figures presented to us by our soil chemist and consider them in relation to the desired crop.

But first let us examine a six-inch sample of subsoil, the sample coming as does the first one, from a 40-acre portion of a 160-acre yard, a 40-acre section in which the crop is quite poor.

SOIL EXAMINATION

1. PH Value 8.0. About 1.2 points too high.
2. Active Calcium—9,290 lb. High.
3. Available Phosphate—40 lb. Low.
4. Available Potash—100 lb. Low.
5. Total Organic Content—0.043 per cent. Very low.
6. Active Magnesium—568 lb. Fair to good.

7. Copper. None.
8. Manganese—10 lb. Medium to poor.
9. No Iodine.
10. 10 lb. Boron. Fair only.
11. 1,100 lb. Sulphur. High.
12. 47,800 lb. Iron. High.
13. No Zinc.

Calcium concentration is considerable, as this subsoil sample shows, in the second six inches of soil, rising as it does, from 2,860 pounds in the six-inch sample to 9,290 pounds in the second six-inch soil. Apparently the second six-inch sample contains about 150 per cent more calcium, based on 2,680 pounds content in the first six-inch depth. That extra calcium content accounts for the .5 ($\frac{1}{2}$ point) higher PH value in sample two.

I am unable to account for the great difference in sulphur, 15 pounds in the first sample, six-inch depth, and 1,100 pounds in the second sample. I can only conclude it is a result of dropping some sulphur on that portion of the soil during a dusting operation. I know from experience that with 1,100 pounds of natural sulphur content, plus 9,290 pounds of calcium and 568 pounds magnesium, the PH figure would hardly be higher than 7.2.

Note the rapidly diminishing phosphate and potash content in the second six-inch depth. This bears out our oft repeated warning to fruit tree growers and others, that the movement of both phosphate and potash downward, when applied on the soil surface, is very slow, perhaps not exceeding an inch in several years unless it is worked into the soil.

The one glaring fault with both soils, as represented by these two samples, is organic content. That these growers have been able to harvest a medium fair crop from this soil, almost barren of organic materials, is testimony to their farming talents.

I understand 10 tons of sheep manure per acre is being applied at this time. I should say, if these owners must make a choice between commercial or chemical fertilizers, in 1948, and manure, the manure should be purchased and the chemical fertilizer application should be delayed another year. It is true, of course, that a combination of the two, 10 tons of manure per acre, plus the correct amounts of a carefully planned commercial fertilizer is the best program. But I cannot believe that any manure has ever been applied to the portion of the hop yard represented by these samples.

The Minor Elements

These soils carry no copper and but 20 and 10 pounds manganese. No iodine is present while the samples contain six and 10 pounds

boron, respectively. Sulphur is low in sample 1, only 15 pounds, while number 2 samples show an excessive amount, which is unlikely to be representative of the 40-acre portions of the yard, represented by the samples.

Both samples are quite representative of Washington or Oregon soils in that they carry a high content of iron. Iron is a peculiar element in that our methods of analysis show it present in a free state; yet we know by experimental work between 1944 and 1947 that often on soils carrying as much as 75,000 pounds iron we must add some iron to our complete soil amendments, or iron deficiencies will occur.

Yet iron alone will not, in ours and in the experience of others, check iron deficiency symptoms.

In my 1947 work with County Agent David Jones of Kennewick, Wash., we noted his efforts to check iron chlorosis on prune trees. He used from seven to 13 pounds iron sulphate per tree on soil which carried over 71,000 pounds iron and on which prune trees showed severe iron deficiency symptoms. In no case did this added iron show any results at all.

The answer is not in using iron capsules, placed in holes bored in the tree but in the fact that iron alone seldom functions. If copper, manganese and zinc are also absent or almost absent in the soil, and iron alone is applied, the iron cannot function unless the other elements are present to fulfill their plant food and catalytic function.

In relation to zinc, we have demonstrated on many orchards, particularly in Wenatchee and Yakima districts and to a limited extent in the Hood River section, that the best, cheapest and most profitable manner in which to apply zinc as a remedy for rosette, is to include it in the soil amendment (fertilizer) used on the crop. It is very expensive, in time and money, to depend upon a zinc spray for the purpose of checking rosette.

Added benefits from zinc applications in fertilizers are of considerable importance for zinc functions not only as a plant food but also as a catalyst for other elements such as iron, copper, manganese, magnesium, boron, molybdenum and perhaps others.

From my own experience, I cannot say just what the function of a minor element is and know I am completely correct. In the case of Washington's most scientific potato grower, Bert W. Colby of Wapato, Wash., we made for him, in 1944, a complete potato fertilizer, based on his soil assay. We urged iron in 1945, and because his soil carried so great an iron content, we eliminated it in 1946. Mr.

(Continued on page 28)

Peanut Land and What It Needs*

By R. M. MARSHALL

Soil Conservation Service, Fort Worth, Texas

UNDER its virgin cover of grass or trees, our soils store up plant food. Past centuries full of plants which have come and gone have enriched the soil, giving it its inherent productivity. When man first sets foot on such land he is impressed by its bounty.

Indeed, he is on rich soil. The first crops set production records which seldom again are equaled in the locality. On the 14,000,000 acres of the Texas and Oklahoma Cross Timbers, for example, the all-time grain production records were set the first years after the land was cleared and broken out of the native sod. That has been less than a half century ago.

Such soils often can continue good and even excellent production for some time. The Cross Timbers kept yielding bumper crops of all sorts for 10 and 20 years after being put into cultivation. Year after year the land was tilled, crops were planted, and then they were harvested and removed. That was good, for the moment, for the landowner's pocketbook. But what was happening to the soil?

We all know. The soil began to lose its "life." That's another way of saying that the store of plant food in the soil was decreasing. Crops were taking plant food off and nothing was putting it back. Production decreased. Much of the Cross Timbers land finally was forced out of cultivation.

Something to correct the situation was needed, but almost a generation passed before a solution arrived. That solution came in the form of farmer-organized soil conservation districts, first established in the late 1930s. The idea, since proved sound, for halting the plant-food removal called for a coordinated program of dovetailing soil conservation practices for each farm. These practices were designed to control the soil erosion and to improve the productivity of the land.

High on the list of the measures came a soil-improving conservation crop rotation. Such a rotation generally called for using a legume crop regularly on each field. Soil Conservation Service technicians helped farmers find out which legumes would work best.

*Reprinted from "Better Crops with Plant Food," March, 1948.

They came up with hairy vetch, Austrian winter peas, and several other soil-improving plants.

These crops aid in anchoring the fields against both wind and water erosion; they cover and tie down the soil. Regular crops do that to some extent in the summer, but it was not until the winter legumes were used that the job could be done in the off-season. Controlling the erosion was primary to making the soil of the Cross Timbers a permanent storehouse of food for growing crops to use.

Soils vary. Unlike soils won't respond the same way to identical use and treatment. Some light-colored soils of the Cross Timbers which are deep, loose, sandy, and inherently low in organic matter and available minerals absorb water rapidly. These soils do not wash easily. That's because they are able to take up water quickly and because the moisture penetrates deeply. But although not highly susceptible to water erosion, these same soils will blow easily under the winds which prevail most of the year. The topsoil either blows away completely or it accumulates in fence-rows and roadsides and fields where it isn't wanted.

Other soils are the reverse. They do not blow much, but they are easy marks for eroding water. Such soils in the Cross Timbers usually have medium-textured surfaces underlain by dense clays. They are moderately low in organic matter and available minerals, and they take water into the subsoil slowly, sometimes very slowly.

Peanut Soils

One of the major crops grown on the sandy lands of the nation is peanuts. Some lands have been planted to peanuts year after year without consideration of the soil's erosion prospects or the maintenance and improvement of its productivity.

The H. H. Lawson farm in the Texas Cross Timbers has been growing peanuts for 35 years on deep, coarse-textured, freely permeable soil. It is good land, suitable for continuous cultivation when the right conservation practices are used to prevent soil-blowing and to keep productivity up.

Mr. Lawson early became a cooperator of

the Upper Leon Soil Conservation District because his knowledge of his own place told him that conservation farming would keep his land permanently in production. The effects of his operations are vivid when contrasted with results where the soil-saving and improving measures are disregarded.

A case in point came to light recently when D. O. Davis, Soil Conservation Service technician, took samples of surface soils in four adjacent fields of the Upper Leon Soil Conservation District. The fields were of the same soil and all of them had been in peanuts for 35 years. In addition to the soil samples, Mr. Davis collected 10 peanut plants at random from each of the four fields.

where conservation measures were most intensive.

Certain levels of plant food and organic matter content must be maintained in the soil if crop production is to be profitable. Experiments have shown the right amounts of fertilizers to use on most of the various soils. Limited data indicate that the plant-food levels for the part of the Cross Timbers near Rising Star and DeLeon, Texas, should be about 35 to 40 parts per million of phosphorus, 80 p.p.m. of potassium, and 750 p.p.m. of calcium, and an organic matter content of at least 1 per cent. Analyses will indicate for any given location the amounts of available plant-food elements. Knowledge of the cor-

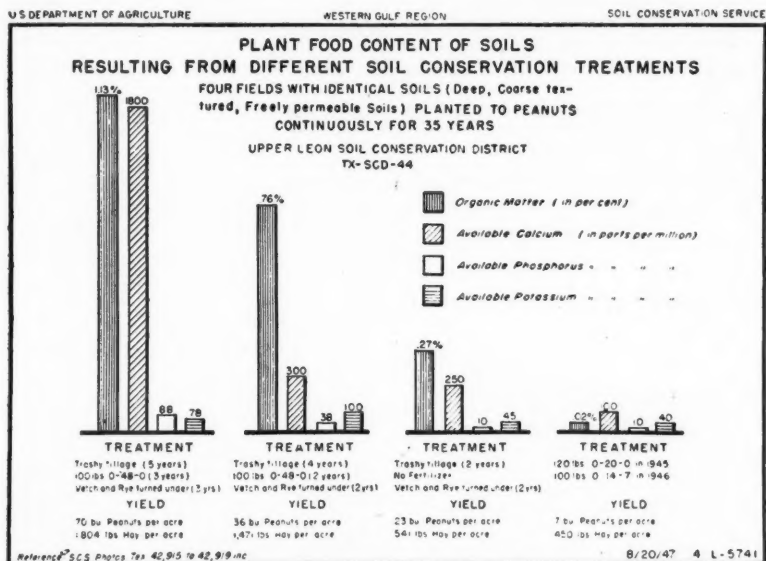


Fig. 1. Plant-food content of soils resulting from different soil conservation treatments

The chart (Figure 1) tells the plant-food content of the soils in the four fields, the treatments that they have received, and the yields of peanuts and peanut hay per acre.

As the chart reveals, a combination of conservation practices was important in securing high yields and in maintaining a high level of fertility. One field where trashy tillage had been used five years, hairy vetch and rye plowed under for green manure three years, and 100 pounds of 0-48-0 fertilizer applied to the legume and rye crops showed the soil contained a great deal more organic matter, available calcium, phosphorus, and potassium than other fields which had received less conservation treatment. Yields were higher

rect level of productivity will show, naturally, needs for soil amendments or fertilizers.

Using a conservation cropping system which includes cover and soil improving crops properly fertilized, strip crops of grain sorghum or crotalaria, and proper management of crop residues are important in minimizing soil losses from wind erosion on these soils and help to maintain and improve soil productivity.

In a conservation cropping system of vetch and rye following peanuts on these deep, coarse, sandy soils, fertilizers applied at the rate of 200 to 300 pounds of 0-14-7 plus six to eight pounds of nitrogen under the legume

(Continued on page 28)

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Potash Deliveries in 1947 Break All Records

Potash deliveries in North America topped the million ton mark for the first time in 1947, according to the American Potash Institute. The five leading producers and two importers delivered 1,071,270 tons K_2O , an increase of 148,143 tons K_2O or 16 per cent over 1946. This potash was delivered in the form of 1,980,324 tons of salts. European potash salts of French and German origin appeared on the United States market again for the first time since World War II and are included in these figures. Importations of European potash into Canada are not included.

Deliveries for agricultural purposes in the continental United States for 1947, were 898,150 tons K_2O , an increase of 134,560 tons over 1946. Canada received 39,205 tons K_2O , Cuba 4,811 tons, Puerto Rico 21,293 tons, and Hawaii 13,183 tons. Exports to other countries amounted to 11,920 tons, a small increase over the preceding year.

In this country the potash was delivered in 43 states and the District of Columbia. Georgia retained its leading position for deliveries of agricultural potash with 86,663 tons K_2O , followed by Illinois, Ohio, Virginia, North Carolina, and Florida each taking more than 60,000 tons K_2O during the year. Consumption, however, does not necessarily correspond to deliveries within a state.

POTASH DELIVERIES Short Tons K_2O

	1947	1946
AGRICULTURAL		
United States		
Muriate 60%.....	714,389	615,098
Muriate 50%.....	67,714	61,585
Manure Salts.....	45,003	21,453
Sulphate and Sul. Pot.-Mag..	71,044	65,454
Total.....	898,150	763,590
Canada.....	39,205	42,772
Cuba.....	4,811	2,327
Puerto Rico.....	21,293	18,958
Hawaii.....	13,183	8,380
Total Institute Territories..	976,642	836,027
Other Exports.....	11,920	10,963
TOTAL AGRICULTURAL.....	988,562	846,990
CHEMICAL		
United States		
Muriate 60%.....	79,494	72,573
Sulphate of Potash.....	2,573	2,224
Total.....	82,067	75,797
Canada		
Muriate 60%.....	639	340
TOTAL CHEMICAL.....	82,706	76,137
GRAND TOTAL.....	1,071,268	923,127

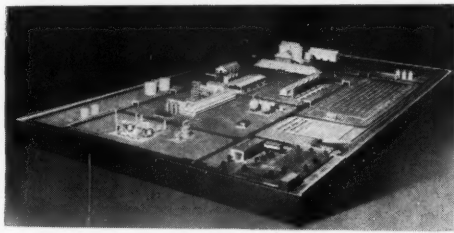
The 60 per cent muriate of potash grade continued to be by far the most popular material, comprising 80 per cent of the total K_2O delivered for agricultural purposes. The 50 per cent muriate of potash grade made up 7 per cent of the total, manure salts 5 per cent, and sulphate of potash and sulphate of potash magnesia 8 per cent. In actual tonnage, the 60 per cent muriate increased by 105,950 tons over 1946, the 50 per cent muriate and both sulphate forms decreased, while manure salts increased.

Deliveries for chemical purposes in 1947 were 127,609 tons of muriate of potash containing an equivalent of 80,133 tons K_2O and 5,078 tons of sulphate of potash containing 2,573 tons K_2O . The total chemical deliveries of 82,707 tons K_2O were 6,570 tons or 9 per cent more than in 1946.

Chemical Construction Corp. to Build Egyptian Fertilizer Plant

A \$5,600,000 credit for the erection of a calcium nitrate fertilizer plant at Suez, Egypt, has been granted by the Export-Import Bank to Egyptian Fertilizer & Chemical Industries, Ltd., Cairo, Egypt, the Department of Commerce has reported.

The estimated total cost of the project is between \$19,000,000 and \$20,000,000. Some of the equipment will be purchased in Great Britain and Egypt, officials stated.



Model of Calcium Nitrate Plant to Be Erected in Egypt

William McC. Martin, Jr., chairman of the board of directors of the bank, said that the calcium nitrate fertilizer to be produced by the new plant is expected to relieve the serious shortage of fertilizer that now exists in Egypt and completion of the plant is of great national interest there.

The Chemical Construction Corp., New York, has been engaged by the Egyptian fertilizer company to design and supervise the project, it was learned.

N. F. A. Convention Program

Plans are well advanced for the annual convention of the National Fertilizer Association to be held at the Greenbrier, White Sulphur Springs, W. Va., on June 21, 22 and 23, 1948. After rendering valuable service during the war as a barracks for enemy diplomats, and later as an Army hospital, this hotel has been completely redecorated and refurnished. On April 15th, the official reopening was held with about 300 celebrities from every part of the country as guests of the Chesapeake & Ohio Railroad, which owns the Greenbrier.

On Monday, June 21st, the N. F. A. Board of Directors will meet. On the same day there will be an open meeting of the Plant Food Research Committee, headed by Dr. H. B. Siems, at which reports will be presented by the chairmen of the various sub-committees. In the evening, Dr. George K. Davis, Nutrition Technologist, College of Agriculture, University of Florida, Gainesville, will show a motion picture dealing with the role of copper in plant and animal nutrition.

The business sessions of the convention will be held during the mornings of Tuesday, June 22nd and Wednesday, June 23rd. Included in the program are addresses by Hon. A. L. M. Wiggins, Under-secretary of the Treasury, Washington, D. C.; Dr. Robert E. Yoder, Chief, Agronomy Department, Agricultural Experiment Station, Wooster, Ohio; Howard W. Selby, General Manager, United Farmers of New England, Charlestown, Mass.; Wheeler McMillen, Editor of *Farm Journal*, Philadelphia, Pa.; Weller Noble, Pacific Guano Co., Berkeley, Cal., Chairman of the N. F. A. Board of Directors; and Maurice H. Lockwood, N. F. A. President.

The annual dinner will be held on the evening of Tuesday, June 22nd.

In addition to Directors to be chosen from individual districts, four Directors-at-Large will be elected. Those whose terms expire are: H. B. Baylor, International Minerals & Chemical Corp.; J. A. Miller, Price Chemical Co.; J. H. Owens, Roanoke Guano Co.; C. T. Prindeville, Swift & Co.

The golf events will be in charge of a committee composed of A. L. Walker, Jr., Chairman; T. E. Bradley, Ray King, C. E. Lightfoot, John A. Miller, J. W. Rutland. The tennis committee will be headed by James Cope. Other convention committees are being appointed and will be announced later.

All reservations for the convention should be made through the management of the Greenbrier Hotel.

March Tag Sales

Reports of state control officials to The National Fertilizer Association reveal that sales of fertilizer tax tags in 15 states during March totaled 1,478,000 equivalent short tons. Such sales were 36 per cent above the 1,090,000 tons reported for the previous March, and were higher than for any March since 1940, at which time sales amounted to 1,523,000 tons.

The 11 Southern States reported total March sales of 1,291,000 tons, an increase of 34 per cent over the preceding March, but a decrease of 2 per cent from the 1,316,000 tons reported for March, 1946. Compared with last March, sales were higher for nine of the Southern States, with increases ranging from 4,600 tons for Louisiana to 111,300 tons for North Carolina. Sales in Tennessee were 600

tons below last March, and in Arkansas they were 6,100 tons lower.

Sales in the four Midwestern States during March, amounting to 188,000 tons, were 46 per cent above the 129,000 tons recorded for a year ago, and 56 per cent above those for March, 1946. By states, sales during March in each of the four Midwestern States were greater than for a year ago, with tonnage increases ranging from 4,400 tons for Kansas to 21,800 tons for Kentucky.

Tag sales in the 15 states for the first quarter of the year, January-March, totaled 4,084,000 short tons, an increase of 11 per cent over the 3,678,000 tons reported for the same period last year. With the exception of the 4,114,000 tons recorded for January-March, 1946, sales during the three-month period just ended were the highest on record.

(Continued on page 26)

FERTILIZER TAX TAG SALES Compiled by The National Fertilizer Association

STATE	MARCH			% of 1947	JANUARY-MARCH		
	1948 Tons	1947 Tons	1946 Tons		1948 Tons	1947 Tons	1946 Tons
Virginia	131,847	95,780	121,236	114	298,512	261,130	288,463
N. Carolina	321,290	210,008	296,836	101	802,176	791,730	895,197
S. Carolina	146,385	120,765	191,301	114	507,316	445,930	522,510
Georgia	242,605	216,103	272,831	104	658,316	631,493	687,035
Florida	99,328	56,325	62,756	127	285,171	224,261	301,484
Alabama	150,262	100,250	190,600	114	441,040	387,600	507,050
Tennessee	47,237	47,832	75,720	88	111,109	125,872	159,091
Arkansas	23,102	29,200	30,450	60	56,638	94,000	71,950
Louisiana	38,540	33,950	24,450	99	84,417	85,580	91,810
Texas	73,912	40,405	43,265	120	166,985	139,244	135,552
Oklahoma	16,027	9,840	6,748	157	56,189	35,740	21,098
TOTAL SOUTH	1,290,535	960,458	1,316,193	108	3,467,869	3,222,580	3,681,240
Indiana	62,955	47,993	44,641	127	222,763	175,107	167,617
Kentucky	66,317	44,478	45,855	131	211,048	160,731	150,938
Missouri	54,020	36,407	28,984	151	150,083	99,427	102,603
Kansas	4,665	300	728	162	32,205	19,898	11,209
TOTAL MIDWEST	187,957	129,178	120,208	135	616,099	455,163	432,367
GRAND TOTAL	1,478,492	1,089,636	1,436,401	111	4,083,968	3,677,743	4,113,607

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FERTILIZER MATERIALS MARKET

NEW YORK

Sulphate of Ammonia Shipments Improving Slowly After Settlement of Coal Strike. Synthetic Nitrogen Materials Still Scarce. Organic Market Shows Better Demand for Future Deliveries. More Superphosphate Moving to Mixers. Potash Prices Unchanged for Next Year

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, April 28, 1948.

Sulphate of Ammonia

While the coal strike has been settled, the supply of this material for immediate shipment is low and certain fertilizer manufacturers have already felt the effect of reduced supplies. It may take several weeks before production is back on a normal basis.

Nitrogen Solutions

Some manufacturers still report not being able to get enough to supply their immediate needs but as soon as the present season is over, a better balance is expected between supply and demand.

Nitrate of Soda

This material continues to be allocated by importers and buyers are taking delivery as fast as material arrives at the ports. The demand is still much heavier than the supply. Naturally there will be some improvement in the supply situation as soon as the present season is over.

Ammonium Nitrate

Manufacturers and buyers are still trying to obtain necessary supplies but little material was actually being shipped.

Nitrogenous Material

Several producers have lowered their prices on this material for nearby shipment, which has induced a number of buyers who have been holding off to re-enter the market. A large quantity of material has been reported sold at the new price level. Stocks are said to be light in buyers' hands.

Organics

While the organic fertilizer materials market is a little slow for nearby positions, a lively interest was shown by buyers for future positions. Vegetable meals churned around in price because of a certain amount of outside speculation in some of the markets. Some

feed manufacturers were showing a little more interest and in some quarters a better demand was looked for. Tankage and blood were quoted around \$6.00 per unit of ammonia (\$7.29 per unit N), f.o.b. shipping points, and although some of the large packers are still on strike and not producing, the demand has not improved. Some fertilizer buying was noted for the first time in several months.

Fish Meal

Some sales were made on a "when and if made" basis for future delivery at from \$125.00 to \$130.00 per ton, f.o.b. fish factories. Most sales were made to the feed trade. Demand for prompt shipment was poor with some re-sale lots available from time to time.

Castor Pomace

Lower prices were heard in the trade on this material but the spot demand has increased considerably the past week and it is believed the prices will stabilize around present levels as stocks in producers hands are not large.

Hoofmeal

The price of this material eased off considerably and offerings were heard as low as \$5.75 per unit of ammonia (\$6.99 per unit N), f.o.b. shipping points.

Superphosphate

Demand for this material has increased considerably and a good part of the stocks on hand that had accumulated, due to bad weather conditions, have been moved. In fact, in certain areas a shortage is reported for quick shipment. It is still difficult for producers to get all the box cars they need to make shipments.

Potash

New prices were announced by two potash producers on the same basis as present. Con-

tracts and bookings were said to be heavy. An occasional shipment of imported potash arrives at North Atlantic ports but this material has been sold before it arrives.

CHICAGO

Organics Market Slow and Uninteresting. Higher Prices Not Expected In Immediate Future

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, April 26, 1948.

The market on animal ammoniates remains in a very slow and uninteresting position. Buying interest in both finished and unfinished products is extremely dull and further declines in grain prices are retarding new business on even a steady basis. These conditions preclude any possibility of higher prices in the immediate future; as a matter of fact, if any change does take place, it will probably be in the other direction.

Wet rendered tankage and dried blood are nominally steady at \$6.50 per unit of ammonia (\$7.90 per unit N). Dry rendered tankage is quoted at around \$1.40 per unit of protein and in most instances the buyers are stipulating this price as delivered rather than f.o.b. shipping point. Steam bone meal is still quoted at around \$60.00 per ton but trading is at a minimum.

PHILADELPHIA

Shortage of Top-Dressing Nitrogen Has Trade Worried. Coal Strike Reduced Sulphate of Ammonia Deliveries. Phosphate Rock Prices Advance

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, April 25, 1948.

The shortage of chemical nitrogen is serious, and in some sections the requirements for top dressing are much greater than can be satisfied. There is an easier feeling in the trade because of the improved coal situation. The consumption of mixed fertilizers in the East is expected to be quite a little under last season, although other sections of the country are likely to use more, and thus bring the total up to last season.

Sulphate of Ammonia.—The coal strike has cut back production and some of the producers are said to have indicated that they may have to reduce deliveries on standing contracts. In some localities the requirements for top-dressing are exceedingly urgent, while the supply is inadequate. Resale material, when obtainable, commands quite a premium.

Nitrate of Soda.—Demand is much in excess of the supply, and there is no indication of early improvement.

Ammonium Nitrate.—Distribution against

contracts is said to have improved, but the supply is much below requirements.

Castor Pomace.—While quotations are still nominally at \$40.00 per ton, f.o.b. producing plants, sales have been reported at \$27.50 covering deliveries over the next five months.

Blood, Tankage, Bone.—The demand is unusually slack for blood and tankage. Quotations have been nominal at \$7.00 per unit of ammonia (\$8.51 per unit N) for both blood and tankage, but counterbids were solicited. Some tankage sold at \$5.25 to \$5.50 (\$6.38 to \$6.68 per unit N), while nitrogenous is quoted at \$4.00 (\$4.86 per unit N) for delivery through the coming summer and fall. There is active demand for bone meal, with supply limited and contract shipments behind schedule.

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Fish Scrap.—Scattered lots of menhaden meal have appeared at \$125.00 to \$140.00 per ton, with the market mostly nominal.

Phosphate Rock.—The Florida price is said to have been advanced. The general demand continues in excess of production, and the market position is reported tight.

Superphosphate.—The supply is easier and shipping conditions are much improved. Price situation is not too strong.

Potash.—Demand continues to keep well up with production. Contract prices for the coming season are same as last year.

CHARLESTON

Nitrogen Still the Chief Bottleneck in Fertilizer Materials. Phosphate Rock Prices Higher. Potash Prices Unchanged

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, April 26, 1948.

Nitrogen continues the main bottleneck in the production of mixed fertilizers, and the prospects for next year's supplies of this article appear to some buyers to be worse than the present season's supplies. Superphosphate is not quite the problem it was this time last year, and potash shipments are back on schedule, but still unable to meet completely the call.

Organics.—Sales of nitrogenous tankage and castor pomace have been made recently at considerably reduced prices compared with last year's prices at this time. Sales have been made for shipment during the summer, fall, and spring, with nitrogenous tankage ranging in price from \$3.25 to \$4.00 per unit of ammonia (\$3.95 to \$4.86 per unit N), in bulk, f.o.b. production points, depending on the shipping point. South American organics are entirely too high for use by domestic fertilizer buyers.

Castor Pomace.—Sales have been made recently at around \$27.50 per ton f.o.b. eastern

production point, for shipment during the summer. This is in bags, and a limited tonnage only was offered.

Potash.—Contracts for the period beginning June 1st through May 31st, 1949, have been offered by one producer at 37½ cents per unit of K₂O for muriate of potash, and at 20 cents per unit for manure salts, car lots, bulk, f.o.b. Carlsbad, New Mexico. These prices are the same as the 1947-1948 prices. Demand continues active.

Nitrate of Soda.—The market is tight with demand far ahead of supply. No increase in price has been reported. Two large nitrate plants are planning installation of a new process for production of potash nitrate, and it is hoped that it will mean a 30 per cent increase in production during 1948.

Sulphate of Ammonia.—Deliveries have been behind because of the coal shortage, but the situation is expected to improve as a result of settlement of the coal strike. Market continues tight.

Dried Ground Blood.—New York market is around \$7.00 per unit of ammonia (\$8.51 per unit N) in bulk, but little interest is shown. The Chicago price is \$6.50 per unit of ammonia (\$7.90 per unit N).

Tankage.—Wet rendered tankage is on the easy side with offers from \$6.00 to \$7.00 (\$7.29 to \$8.51 per unit N), f.o.b. New York production points. Chicago price is around \$6.50 (\$7.90 per unit N), with little interest shown, at either market.

Superphosphate.—Movement from the works has improved with the better weather conditions, and the market is firm.

Phosphate Rock.—Demand continues in excess of production, and stocks are practically nil. Recently there was an increase in oil and labor costs at the mines, resulting in an average of 43 cents per ton additional cost to acidulators.

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Lion Oil Reports Good Year

The annual report of Lion Oil Company for 1947 shows a gain in net earnings of more than 100 per cent, according to an announcement by Col. T. H. Barton, board chairman, and T. M. Martin, president. The 1947 profits were \$7,991,281, compared to \$3,965,779 in 1946. Sales increased by 48 per cent during 1947. About one-third of this increase was due to a full year's operation of the chemical division, whereas the year 1946 included only seven and one-half months' operations. The outlook for sales of nitrogen solutions during 1948, according to the report, is most encouraging.

American Potash & Chemical Corp. Shows Increased Earnings

Earnings of American Potash & Chemical Corporation during 1947 increased 39 per cent over 1946, while production and sales rose to an all-time high, according to the annual report of the Company.

Net income for the calendar year 1947 totaled \$2,106,319 or \$3.60 a share, compared with \$1,514,105 or \$2.87 a share for 1946. Quarterly dividends totalling \$1.50 a share were paid during 1947 on the Class A and B stocks and an extra dividend of 50 cents a share was paid on January 5, 1948.

Total production of primary chemicals at the Trona, California plant was 594,764 tons against 541,327 tons in 1946, and sales amounted to \$13,637,700, compared with \$10,738,368 in the year previous. Included in the 1947 production was 221,825 tons of potash salts and 110,209 tons of borax. During 1947 the Company's net working capital rose from \$6,627,648 to \$10,461,629.

In their message to stockholders in the annual report, Board Chairman B. R. Armour

and President Peter Colefax announced that construction of additional soda ash and borax plant capacity was begun last July and additions to the power plant, which will more than double the plant's electrical generating capacity, also were started. A two-story office building in Los Angeles to house the Company's executive and administrative staff and western sales organization was completed last December.

The additional plant facilities, which were financed by the sale of 70,000 shares of \$4 Cumulative Preferred Stock, are expected to be in production later this year and earnings from them should be available in 1948, the report declared.

The report points out that the gain in earnings was accomplished despite continued increases in the cost of labor, materials, supplies and services. Against these higher costs the Company achieved greater production and made larger sales in more favorable markets.

Phosphates Increase Minnesota Protein Supply

Phosphate fertilizer on alfalfa is helping Minnesota farmers avoid a protein shortage. A four-year study made by workers at Minnesota Agricultural Experiment Station shows that phosphate produced a striking increase in total protein yield. Most of this increase, according to *Capper's Farmer*, came in greater tonnage of hay, but about 47 pounds of protein an acre was due to more protein in the roughage.

"Minnesota agronomists," says the farm magazine, "analyzed samples from 69 fields from the Canada border to the Iowa line. Protein yield from the phosphated portions of these fields averaged 1,268 pounds an acre. That means each acre of alfalfa produced nearly as much protein as 1½ tons of oil meal.

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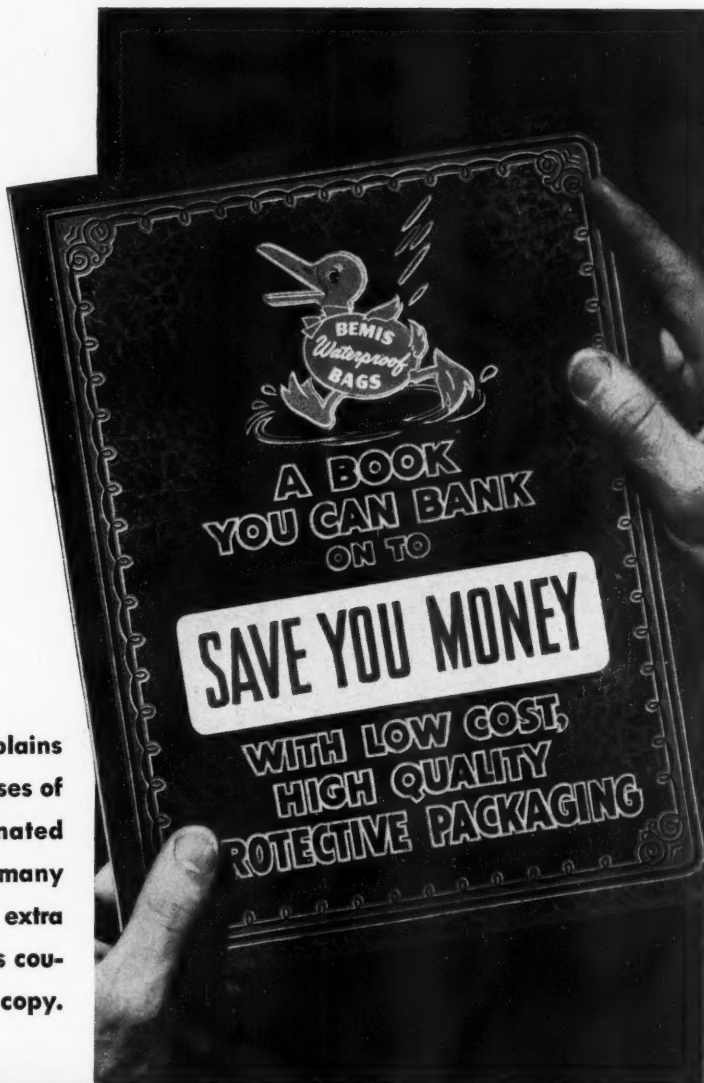
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This increase was equivalent to the amount in a half ton of protein meal."

The farm magazine says the average hay yield was stepped up from 2.13 tons an acre to 3.14 tons. It would have taken 1,577 pounds of bone meal per farm to have supplied the livestock with the extra phosphorus produced by the fertilizer.

"Most farmers who co-operated in the tests were using five or six year rotations in which alfalfa was cut for hay two or three years. They applied 300 to 400 pounds of 0-20-0 or 150 to 200 pounds of 0-47-0 an acre once in the rotation. The application was made on small grain which nursed the alfalfa seeding."

New Mexico Potash Mining Methods Described

A survey of the operating procedures of the Potash Company of America in the Carlsbad region of New Mexico—one of the nation's chief sources of commercial-grade potash—is presented in a report made public on April 24th by the Bureau of Mines.

Designed to promote safer and more efficient production techniques in the domestic mining industry, this report is one of a series of Bureau publications describing mining practices and methods in various mining districts of the United States.

Although potash was first found in the Carlsbad area in 1925, commercial exploitation of the region did not begin until 1931, the publication points out. Two years later, in 1933, the Potash Company of America started shaft-sinking operations and was in production by the following year.

Because potash deposits in the Carlsbad area resemble flat coal beds, coal-mining equipment and methods have been used successfully, according to the report, which also deals with the geology of the area, methods of sampling and estimation of tonnages and values, transportation and ventilation.

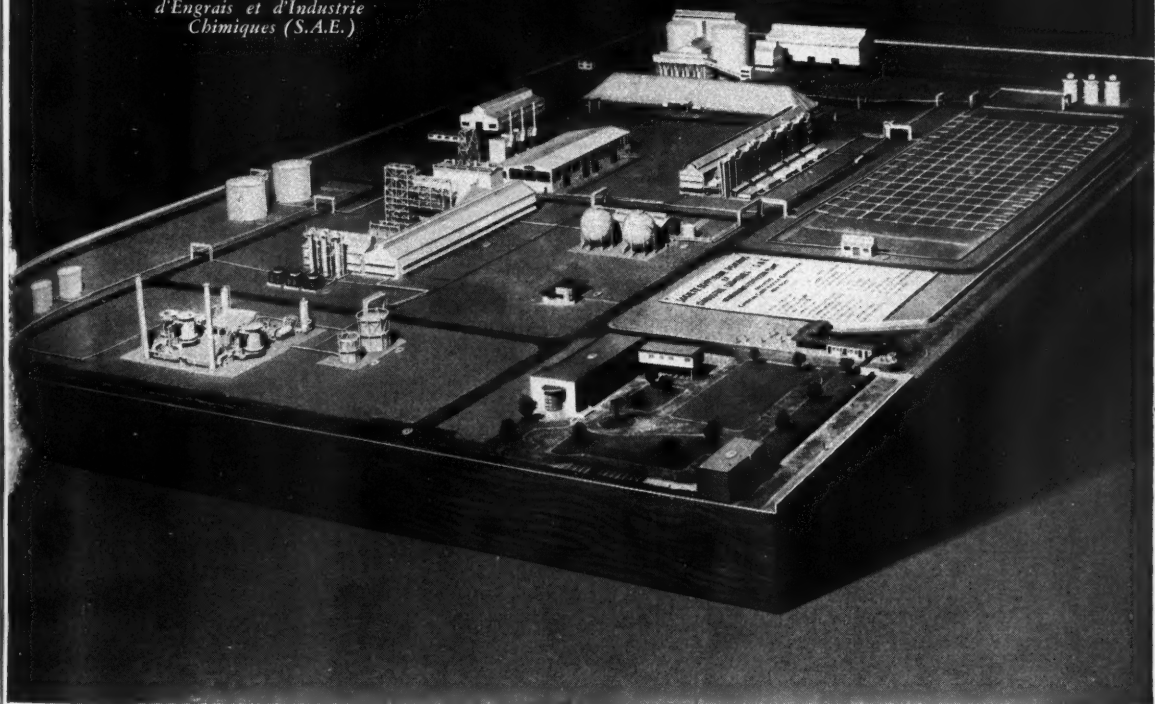
Other topics discussed in the report are safety measures, current wage scales, and company organization. Several photographs of the surface plant and underground workings as well as charts illustrating mining methods reviewed in the text are included in the publication.

A free copy of Information Circular 7445, "Mining Methods and Practices at Potash Company of America, Eddy County, N. Mex.," by Walter R. Storms, Bureau mining engineer, may be obtained by writing to the Publications Section of the Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

FERTILIZER *for* EGYPT

200,000 TONS PER YEAR

Scale model of Chemico Fertilizer Plant to be built at Suez for Societe Egyptienne d'Engrais et d'Industrie Chimiques (S.A.E.)



Destined to play a significant part in meeting Egypt's urgent need for fertilizer, this modern chemical plant will produce 550 tons of calcium nitrate every day . . . nutrition for the starved soil of the Nile Valley.

This important Chemico project, now in the design stage, actually will include three plants in one . . . a Synthetic Ammonia Unit, a Pressure Nitric Acid Plant, and a Calcium Nitrate Plant. Still gases piped from oil refineries will provide hydrogen . . . air will furnish the nitrogen. Water

will come from the Nile. Limestone will be hauled from quarries 20 miles distant. Chemico will also provide complete facilities for the production of power and process steam. The plant will operate continuously . . . almost automatically.

This fertilizer plant is but one of several similar large-scale projects on which Chemico is retained for design and construction. In Egypt, India, Mexico . . . in strategic places the world over . . . Chemico-built plants will help to meet the world's fertilizer needs.



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N. F. A. Board Visits TVA

The Board of Directors of the National Fertilizer Association held its spring meeting in Florence, Alabama, on April 14th, following a meeting of the Executive Committee on the previous day. In the absence of Chairman Weller Noble, Vice-chairman Ray L. King presided. Reports on the program for the coming annual convention were discussed and a tentative budget for the coming association year was approved for submission to the members at the annual meeting.

In the evening a dozen members of the staff of the Tennessee Valley Authority joined the Board members at dinner, which was followed by a discussion of mutual problems dealing with fertilizer production and distribution.

On April 15th, the Board visited the TVA plant at Wilson Dam and inspected the various laboratories and the facilities for manufacturing elemental phosphorus, double superphosphate, calcium metaphosphate, fused tricalcium phosphate, and ammonium nitrate.

Following luncheon, Gordon R. Clapp, chairman of the TVA Board, and other TVA staff members joined in a discussion on the question of a broadening by TVA of its policy of distributing commercial quantity production of fertilizer materials so as to include proprietary units in the industry. C. T. Prindeville of the N. F. A. Board and chairman of its Public Relations Committee led off in the discussion of relationships between the industry and TVA as a Government corporation. The policy expressed by the Association is that when Government corporations such as TVA have commercial volume production of fertilizer materials to distribute, they should be offered on equal terms to all segments of the industry rather than on a discriminatory basis.

Chairman Clapp outlined the present TVA policy, stressing the relation of their commercial volume distribution to their test demonstration program in which new products are first used. President Lockwood of N. F. A. pointed out that the industry questions the soundness of the TVA policy of endeavoring to force distribution of its phosphates for direct application or in mineral mixtures only, and questioned the effectiveness of TVA's claimed restrictions on the distribution of its double superphosphate in the pattern they described.

Mr. Clapp and his associates stated that only five per cent of TVA's commercial vol-

ume distribution of double superphosphate is used in mixtures containing nitrogen.

The N. F. A. presentation of this problem began some months ago by correspondence with TVA, and at the close of the round-table discussion with the TVA staff the problem was left with Chairman Clapp and his associates to follow up. The exchange of ideas with the TVA staff offered a splendid opportunity for the two groups to become better acquainted and to understand more fully each other's ideas.

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of production make it hard to pay production costs, as well as the additional costs of the large amounts of fertilizer which will be needed to build back the fertility. The production costs have to be paid, but the money for fertilizer goes toward paying off the mortgage."

Commercial Solvents Issues New Booklet on Ammonia

A comprehensive 48-page booklet, "Ammonia—Its Uses and Properties," has just been issued by the Agricultural Division of Commercial Solvents Corporation, 17 East 42nd St., New York, N. Y.

Liberal illustrated with photographs, sketches, and charts, the booklet contains general information on the use of ammonia in agriculture and industry. It collects under one cover a large amount of data in the form of convenient tables and charts on the chemical and physical properties of both anhydrous and aqueous ammonia and describes the proper handling of ammonia in shipment, unloading and storage.

The booklet includes a short section devoted to a description of CSC's anhydrous ammonia unit at the company's Dixie Plant, Sterlington, La.

Freight Rates Increased

The Interstate Commerce Commission has issued a third Supplemental Report on Ex Parte 166 permitting temporary freight rate increases to be substituted for the present temporary increases of 20 per cent as follows: Within Official Territory, 30 per cent; within Southern Territory, 25 per cent; within Zone A Western Trunk Line Territory, 25 per cent; within Western Territory, 20 per cent; and between any of these territories, 25 per cent. Maximum increases of \$1.20 a net ton and \$1.35 a gross ton on phosphate rock, of 10 per cent on sulphur, and of \$1.60 a net ton and \$1.80 a gross ton on fertilizers and fertilizer materials are fixed by the Commission's report.

Going Straight

One of the most astonishing facts from the 1947 traffic accident record is this: more than 80 per cent of automobiles involved in fatal accidents last year were going straight ahead. Only one out of each five of the faulty motorists was turning, backing, skidding, stopping or stopped when the death-dealing crash came. The other four were going straight.

The reason, according to The Travelers Insurance Companies of Hartford which annually compile and analyze the record, is the false sense of security most drivers assume on the straightaway. If they are turning right or left, they are alert for obvious hazards. If they are backing up, they are likely to proceed with caution. If they are preparing to stop, they drive with the care experience has taught them is indicated.

But when they shift into high gear with the expectation of driving a few consecutive blocks or a few consecutive miles in the same direction, they also shift into a careless frame of mind. Driving becomes almost automatic and they relax. The relative monotony of this type of driving has an almost soporific effect. Under these conditions they become the target for many dangers.

MARCH TAG SALES

(Continued from page 14)

In the 11 Southern States, January–March tag sales totaled 3,468,000 tons, or 8 per cent more than for the corresponding period last year. For eight of the Southern States, first quarter sales were greater than for a year ago; increases ranged from 1 per cent for North Carolina to 57 per cent for Oklahoma. First quarter sales in the four Midwestern States of 616,000 tons were 35 per cent above those for last year. Compared with the first three months of 1947, January–March sales this year were higher for each of the four states.

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PEANUT LAND AND WHAT IT NEEDS

(Continued from page 11)

have resulted in increased yields of peanuts from 30 per cent to sometimes as high as 100 per cent.

Hairy vetch and rye used as a green manure soil-improving crop in the Cross Timbers not only hold the soil in place and increase the organic matter, but help make plant foods available to plants. Managing the crop residues so that as much plant litter, stalks, and stems as possible will remain at the surface of the soil is an important wind-erosion control practice in the Cross Timbers. After sorghums are combined, good wind-erosion control can be obtained by using a stalk cutter and then harrowing the fields to leave a trashy mulch at the surface.

In areas of deep sandy soils in warm climates, organic residues decompose rapidly. That forces us to give measures which maintain or improve the organic matter major consideration in soil and moisture conservation programs. Organic matter is of use mainly while it is decaying or being destroyed. It is while this process is going on that it makes available nitrogen and minerals needed by growing plants. Obviously, organic matter lost by decomposition needs to be replaced in the soil.

Research shows that a crop of hairy vetch which yields about a ton of dry matter an acre will add about 1,000 pounds of vegetal matter to the soil. However, these 1,000 pounds stay in the soil as a part of the humus only a limited time.

Continuous cropping with peanuts when all the plant, below and above ground, is carted off in the harvest therefore tends to lower the soil's organic matter content, reduce the productive capacity, and make the land susceptible to blowing. Some part of the crop ought to be left so that succeeding crops will have plant food to draw upon.

SOILS, HOPS, MINOR ELEMENT FERTILITY

(Continued from page 9)

Colby was the first to notice the effects of iron deficiency symptoms, not so much in leaf symptoms, as in yield quality. Therefore, since 1946, and for 1948, his fertilizers carry correct amounts of iron in addition to the other 11 elements used in computing it.

To return to the two soil samples which we examined, our fertility treatment, based on this soil analysis, is as follows—and bear in mind, it is based solely and only on this particular soil.

Broadcast 1,000 pounds per acre of a fertilizer made as follows:

Ten per cent nitrogen; 3 per cent combination two types organic nitrogen; 7 per cent inorganic nitrogen; 14 per cent available phosphate; 10 per cent available potash.

Each acre is to receive the following:

- 50 lb. Magnesium Sulphate
- 50 lb. of a certain type Copper
- 50 lb. of a certain type Manganese
- 20 lb. of a certain type Iron
- 50 lb. of a certain type Zinc
- 20 lb. Borax (Boron)
- 4 lb. Cobalt Sulphate
- 2 lb. Iron (Potassium Iodide)

If the grower prefers to apply three-quarters to one pound per plant, we would reduce the borax to 10 pounds per acre. But based on this particular field's evident need, as indicated by the soil analysis, the broadcast method is best to consider at a beginning of a four-five year soil building program.

Another very important point to consider is the need on this soil as indicated by sample number 1, of the top dressing of this yard with 400 to 500 pounds of calcium sulphate for the purpose of adding to the soil added sulphur and calcium. Sulphur can of course be placed in the fertilizer but the cost of elemental sulphur is much greater than the grower need pay. Therefore the gypsum recommendation



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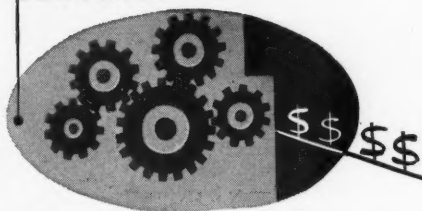
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This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and the Advertising Council.

I have previously referred to the grave need of organic matter in your soils. I know the same advice is applicable to every hop ranch in any of our Western states. I suggest a carefully planned five-year green manure program and this program includes the application, broadcast of 400 pounds (1948 fall), of a fertilizer made as follows:

Eight per cent nitrogen; 2 per cent organic source; 6 per cent inorganic source; 10 per cent phosphate; 10 per cent potash.

Each acre also to receive as follows:

20 lb. Magnesium
20 lb. Copper
20 lb. Manganese
20 lb. Zinc
10 lb. Borax
10 lb. Iron

The cover crop would be of the ranch's choosing. If peas are used, cut down the borax to five pounds per acre.

Such a program will produce a heavy cover crop, but one of the program's chief values is that all those elements, nine in number, will be absorbed by the growing green cover crop and will be transformed from inorganic compounds into organic form and then, when disked or otherwise turned under, will supply your growing hop plant with food as nature planned for, organic compounds. There is no surer or better way of rebuilding your soils unless you have access to heavy tonnages of natural manure, for which I assure you there is no substitute.

Changes in Fertilizer Laws Needed

I want to sound a warning. There is a grave need for amendment to the present fertilizer laws in Oregon and Washington. In much of the fertilizer literature distributed in these two states (I do not refer to California) I find, as you can, statements which I feel are untrue and which relate to the so-called minor element content of fertilizers. These booklets or pamphlets claim that all fertilizers offered for sale carry all the minor elements.

Such claims are untrue and can only be made for the purpose of misleading the buyer. The only way it is possible for copper, etc., to find its way into a bag of any producer's fertilizer is—if it is placed in the mixer. It is true these elements in microscopic amounts may

be found in any fertilizer or in any vegetative product by a spectroscopic analysis. By this method you can find them in your hat or your shoes or shirt. Fertilizer laws should prohibit such false advertising, thus protecting the farmers against unscrupulous agencies. No company should be permitted to claim any element or ingredient in a fertilizer unless an absolute guarantee in terms of percentages is printed on the bag and on the tag. Further, with the Fertilizer Control Agency of his state or the state in which he makes a shipment, a certified formula certificate, together with a certified sample of the shipment.

Only in this way can this business of building scientific commercial fertilizer be protected from those who wish to abuse the program and only in this way can you, the consumer secure absolute protection for yourselves.

Such failures of fertilizers which were presumed to carry all the elements to which I refer, are largely due to the fact that they did not actually contain anything except common or ordinary sulphate of ammonia, phosphate and potash. Such a fertilizer as I have formulated for you may cost nearly \$100.00 per ton and to you it will probably be the cheapest fertilizer you could buy, but to one like myself, engaged in a sort of a crusade to teach the use of better fertility amendments, it is highly disconcerting to read an advertisement which plainly states that you, the grower, can buy a 10 to 12 element fertilizer at ordinary fertilizer prices. Both you and I need protection and you can do a great deal more than I can in attaining state governmental protection.

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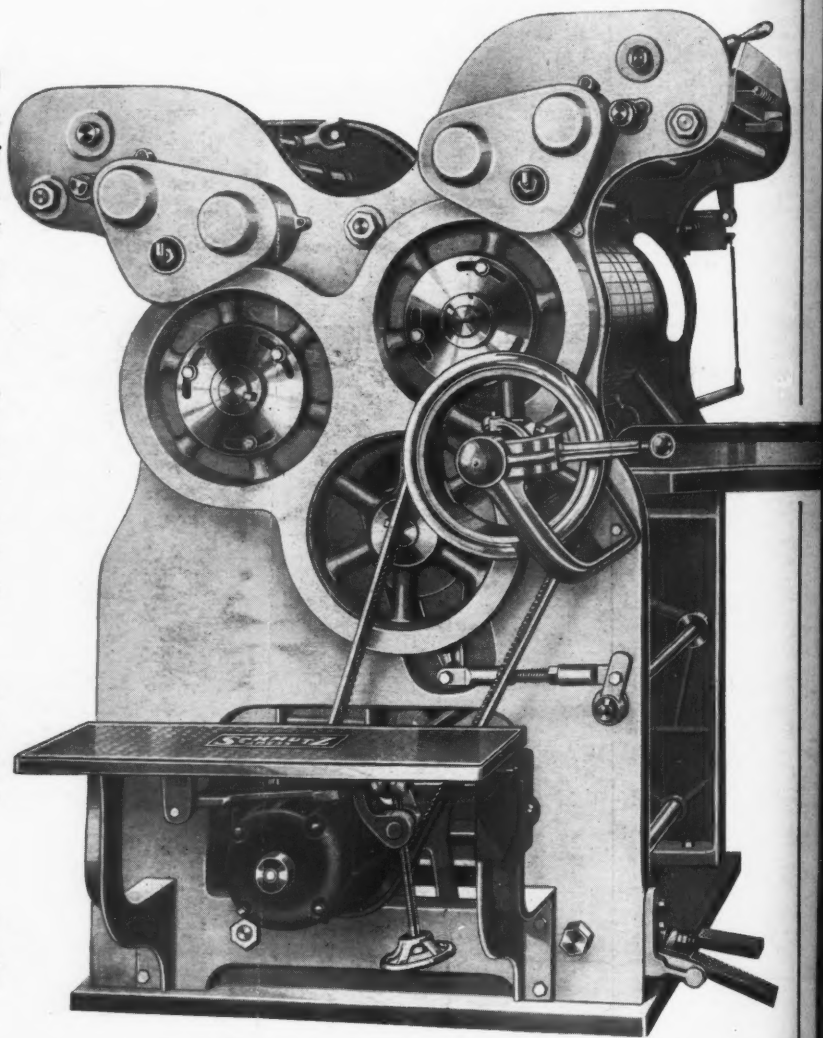
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